



Early Detection of Structural Mold with SilcoCan™ Air Sampling Canisters

Early detection of mold growth in buildings is critically important to protecting human health and property values. Restek **SilcoCan™ canisters** allow low levels of mold to be detected in air samples—before it can be seen—providing an opportunity for structural repair and safer living conditions.

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Mold growth in homes has been linked to serious human health and property value issues; thus, early detection is of increasing importance. Mold releases microbial volatile organic compounds (MVOCs) which can be sampled in air and identified by GC/MS analysis, even prior to visual detection methods. MVOCs attributed to fungal growth include terpenes, ethers, ketones, alcohols, aldehydes, aromatic and chlorinated hydrocarbons, sulfur-based compounds, and amines. These compounds are not unlike other volatile organic compounds commonly analyzed in environmental and industrial hygiene laboratories, and the same equipment can be used to collect, positively identify, and quantify MVOCs.

Due to the polar nature of many MVOCs, and the low concentrations found in early detection, a passivated, large volume collection device is needed for sampling. SilcoCan™ canisters are an excellent choice for sampling and analyzing MVOCs. The canister surface, passivated with a chemically bonded fused silica layer, has been shown to provide the stability and inertness needed for collecting and storing low level volatiles (ppbv) such as those analyzed by EPA methods TO-14A and TO-15, including sulfur-containing compounds and microbial VOCs. Here we show a successful application of highly inert SilcoCan™ canisters and GC/MS for monitoring low level mold growth in building structures.

Table I Boiling points of low volatility MVOCs.

MVOC	bp (°C)
1-octanol	194
isoborneol	212
α-terpineol	214
geosmin	270

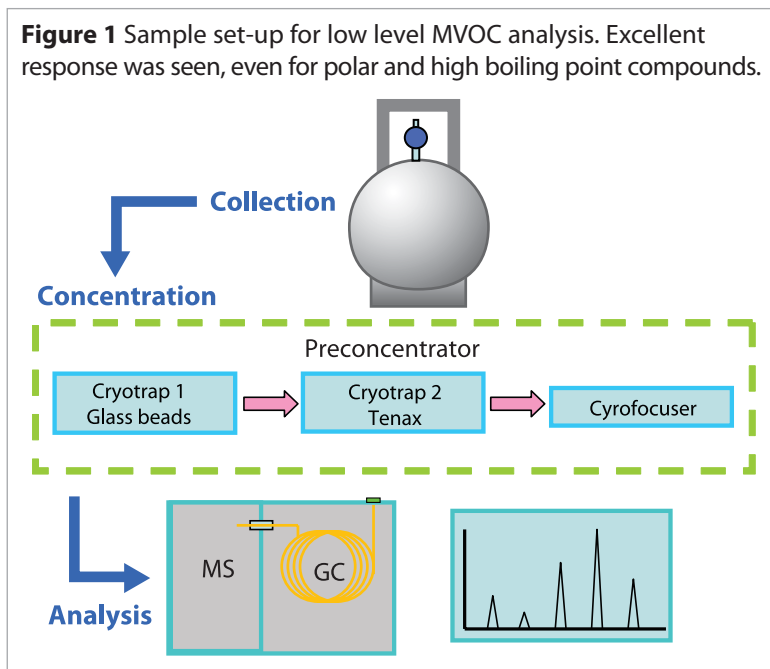
Sample Set-up

For our analysis, we began with standard solutions of 23 MVOCs in methanol at 100µg/mL. The compounds were separated by chemistry into four solutions to prevent degradation reactions: alcohols, ketones, 2-isopropyl-3-methoxypyrazine, and geosmin. After cleaning and evacuating a SilcoCan™ canister, 210µL of water were added to the canister to simulate natural humidity and aid recovery. After equilibration, 2µL of each solution were added to the canister. Finally, the canister was pressurized to 30psig with dry nitrogen to yield a final concentration of 2.2ng/200mL for each MVOC, or 1.4 to 3.8ppbv of each MVOC. (The final ppbv concentration is molecular weight-dependant.) To boost recoveries of the higher-boiling compounds, we used a Restek Air Canister Heating Jacket set to 75°C. The sample was heated to 75°C for 30 minutes prior to, and during testing. Boiling points of some of the lower volatility MVOCs are shown in Table I.

23 MVOCs Identified in Less than 30 Minutes

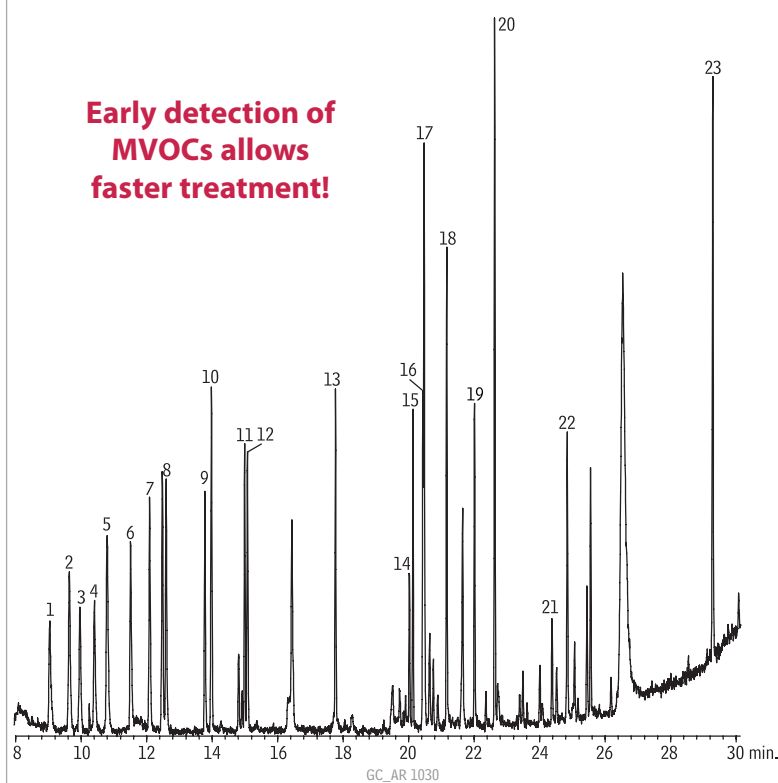
Sample analysis was conducted using standard air analysis equipment such as is used in environmental laboratories. In our case, we used a Nutech 8900DS autosampler and preconcentrator attached to an Agilent 6890/5973 GC/MS. Volatiles in the sample are concentrated by a cryogenic trap followed by an adsorbent trap, then cryofocused for injection into the GC/MS. Figure 1 shows a schematic of the sampling and preconcentration process. An Rxi®-1ms column was used to provide separation at the ultra-low bleed levels required for spectroscopic analysis. The MVOC sample was analyzed by concentrating 200mL of the 0.011ng/mL gaseous mix using a 1:1 split for only 1ng on column of each MVOC. The resulting chromatogram, shown in Figure 2, shows excellent peak response and resolution for the 23 compounds in less than 30 minutes.

Figure 1 Sample set-up for low level MVOC analysis. Excellent response was seen, even for polar and high boiling point compounds.



Passivated SilcoCan™ canisters are ideal for sampling low concentrations of MVOCs. The inertness of these canisters provides an exceptional storage environment, particularly for polar and high boiling point compounds.

Figure 2 Detect low levels of structural mold using SilcoCan™ canisters for air sampling (1ng on-column).



Early detection of MVOCs allows faster treatment!

Compound	Rt (min.)		
1. 2-butanone	9.047	12. 2-hexanone	15.080
2. 2-methyl-furan	9.640	13. 2-heptanone	17.767
3. 3-methyl-furan	9.962	14. 1-octen-3-ol	20.019
4. 2-methyl-1-propanol	10.405	15. 3-octanone	20.133
5. 2-methyl-2-butanol	10.791	16. 3-octanol	20.433
6. 1-butanol	11.506	17. 2-pentyl-furan	20.476
7. 3-methyl-2-butanol	12.092	18. 2-ethyl-1-hexanol	21.163
8. 2-pentanol	12.592	19. 1-octanol	22.013
9. 2-methyl-1-butanol	13.779	20. 2-isopropyl-3-methoxy-pyrazine	22.628
10. dimethyl disulfide	13.979	21. isoborneol	24.379
11. 3-hexanone	14.994	22. α-terpineol	24.844
		23. geosmin	28.347

Column: Rxi®-1ms, 60m, 0.25mm ID, 1.00µm (cat.# 13356)
 Sample: microbial volatile organic compounds (MVOCs), 2ppbv, 60% RH
 Inj.: 1.0µL split (split ratio 1:1), 1mm split inlet liner (cat.# 20972)
 Inj. temp.: 200°C
 Carrier gas: helium, constant flow
 Flow rate: 1.5mL/min.
 Oven temp.: 10°C (hold 1 min.) to 235°C @ 8°C/min.
 Det: Agilent 6890/5973 GC/MS
 5 min. solvent delay

Transfer line temp.: 260°C
 Scan range: 35 to 350amu
 Ionization: EI
 Mode: scan
 Other: Nutech 8900DS Preconcentrator
 Conditions:
 Sample = 200mL from canister
 Cryotrap1 = -160°C
 Desorb = 20°C
 Cryotrap2 = 20°C
 Desorb = 200°C
 Cryofocuser = 200°C
 Desorb = 200°C

SilcoCan™ canisters easily provide the inertness and stability required for the collection, storage, and analysis of MVOCs, especially for polar and high-boiling compounds. Air sampling of MVOCs using SilcoCan™ canisters allows for early detection of fungal growth, providing an opportunity for structural treatments to eradicate damaging mold.

Product Listing

Rxi®-1ms Columns (fused silica)

(Crossbond® 100% dimethyl polysiloxane)

ID	df (µm)	temp. limits	length	cat. #	price
0.25mm	1.00	-60 to 330/350°C	60-Meter	13356	

1mm Split Liners for Agilent GCs

ID* x OD & Length	qty.	cat.#	price
1mm Split			
1.0mm x 6.3mm x 78.5mm	ea.	20972	

SilcoCan™ Air Monitoring Canisters

Ideal for low-level reactive sulfur (1-20ppb), TO-14A, or TO-15 compounds

Canisters are the gold standard for ambient VOC monitoring.



Description	Volume	qty.	cat.#	price
SilcoCan Canister, 1/4" Valve	1L	ea.	24180	561
SilcoCan Canister, 1/4" Valve	3L	ea.	24181	581
SilcoCan Canister, 1/4" Valve	6L	ea.	24182	602
SilcoCan Canister, 1/4" Valve	15L	ea.	24183	923

Air Canister Heating Jacket

The ultimate in controlled heating, for reliably cleaning your air canisters!



Description	qty.	cat.#	price
Air Canister Heating Jacket (110 volt)	ea.	24123	

*Not CE certified.

Get some air...

For more information on all air monitoring canisters and products, visit www.restek.com/air

